

**SHOBHIT NIRWAN's**  
**DESIGNED**



# **HUMAN EYE AND THE COLOURFUL WORLD**

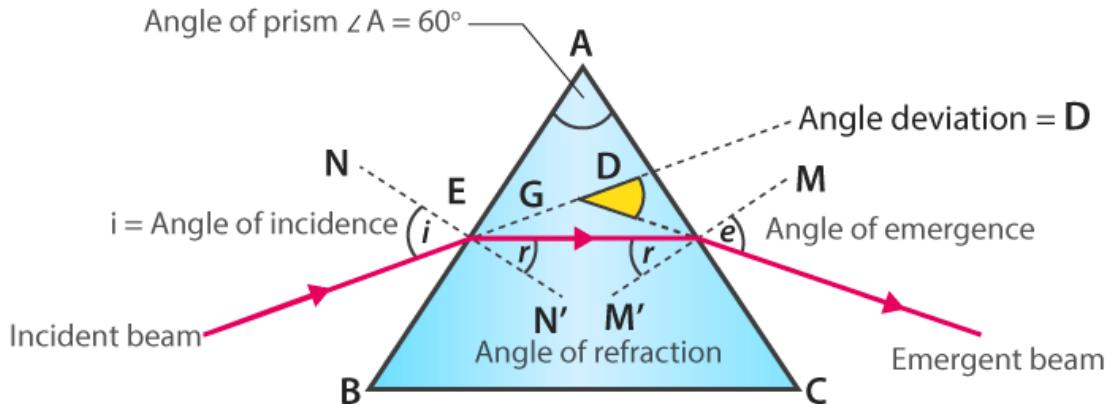
**NEW NOTES FOR CLASS 10 2022 EXAMS**

**Including PYQs in MCQ Format  
NCERT Activities  
Flowchart**

# Prism

[CBSE 2012,2017]

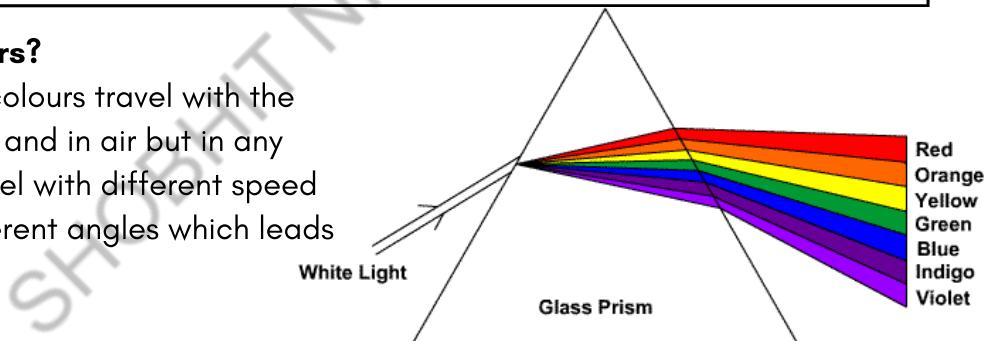
A transparent refracting medium bounded by at least two lateral surfaces inclined to each other at a certain angle.



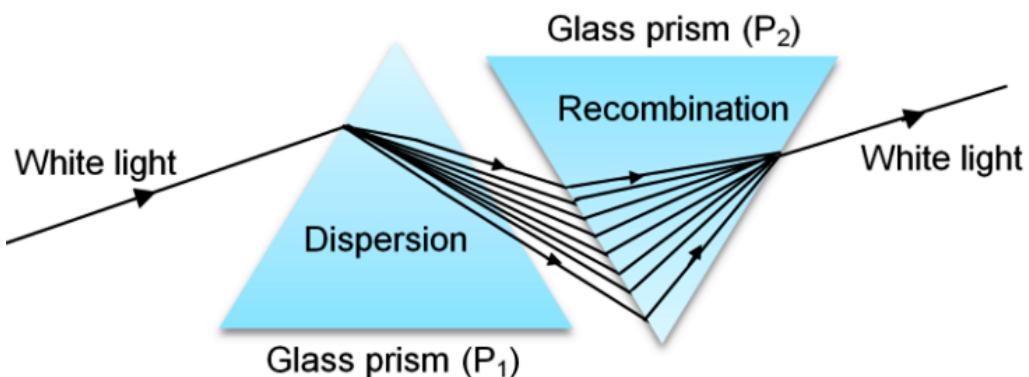
**Dispersion Of White Light By A Glass Prism:** [CBSE 2017] The phenomenon of splitting of white light into its constituent colours when it passes through a prism is called dispersion. This band of seven colours so obtained the VIBGYOR(violet, indigo, blue, green, yellow, orange, red) is called a spectrum.

## Why Dispersion Occurs?

Light rays of different colours travel with the same speed in vacuum and in air but in any other medium they travel with different speed and bend through different angles which leads to dispersion of lights.

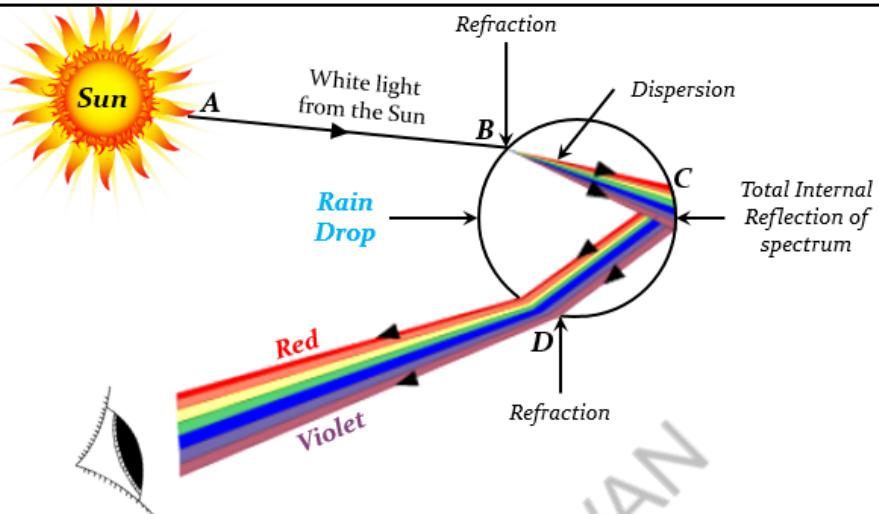


**Recombination Of White Light:** [CBSE 2016,2017,2020] Reverse of dispersion is also possible. Seven coloured light of the spectrum can be recombined to give back white light by passing two prism one by upside down.



**Rainbow:** A natural spectrum produced by the dispersion of sunlight by raindrops in the atmosphere.

- Water droplets acts as a small prisms
- Water droplets refract and disperse the incident sunlight then refract internally and finally refract it again when it comes out of the raindrop.



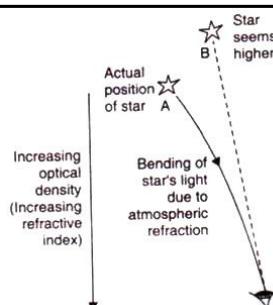
## Atmospheric Refraction

When refraction takes place between two media and if one of the medium is earth's atmospheric then the process is known as atmospheric refraction.

### Effects of Atmospheric Refraction:

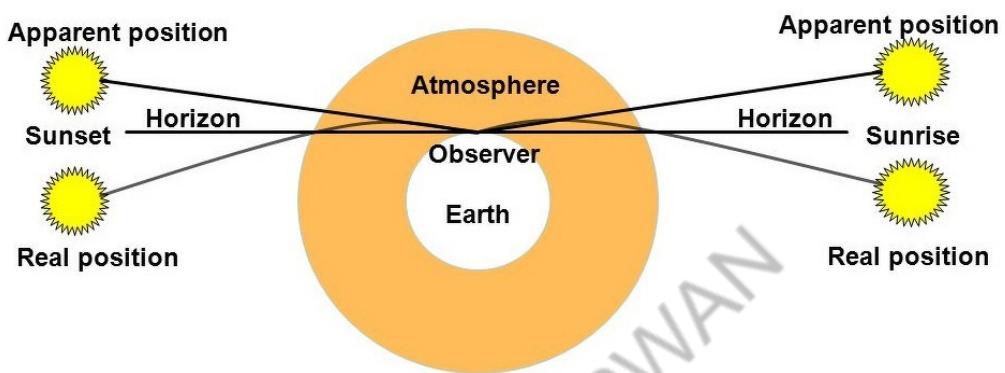
**Twinkling of stars:** [CBSE 2016,2018] The twinkling of stars is due the atmospheric refraction of starlight, the starlight on entering the earth's atmosphere undergoes refraction continuously before it reaches the earth. In this way the starlight reaching our eyes increases and decreases continuously and the stars appear to twinkle at night.

**Stars seem higher than they actually appear:** [CBSE 2017] As the light from a star enters the earth's atmosphere it undergoes refraction and bends towards the normal each time due to the atmospheric refraction. Therefore, the apparent position of the star is slightly different from its actual position. The star appears to be slightly higher than its actual position when viewed near the horizon.



**Planets do not Twinkle:** The planets are much closer to the earth and are considered a collection of a large number of sized sources of light, the total amount of light entering from all the individual point sized sources will average out to zero thereby nullifying the twinkling effect.

**Advance sunrise and Delayed sunset:** [CBSE 2014,2016] The sun is visible to us two minutes before the actual sunrise and about two minutes after the actual sunset. This is due to the atmospheric refraction.



## Scattering of light

The reflection of light from an object in all directions is called scattering of light. It depends on type of particle

- Very fine particles scatter mainly in blue colour.
- Large sized particle scatter light of longer wavelength
- Shorter wavelength greater will be the scattering

## Effects Of Scattering Of Light

**Tyndall Effect** The earth's atmosphere is a heterogeneous mixture of minute particles of smoke , tiny water droplets, dust of air which becomes visible due to scattering of light.

**Colour of Sky is blue:** [CBSE 2012,2015] The molecules of air and other fine particles in the atmosphere have smaller size and are more effective in scattering light of shorter wavelength at the blue end than light of longer wavelengths at the end. Thus when sunlight passes through the atmosphere the tiny particles in air scatter the blue colour more strongly than red. The scattered blue light enters our eyes which makes the colour of sky blue.



### **Kuch Kaam Ki Baat (K<sup>3</sup>B) :**

- If earth had no atmosphere then there would not have been any scattering then the sky would have looked dark. The sky appears dark to the passengers flying at very high altitudes.
- Danger signal lights are **RED** in colour as the red is least scattered by fog or smoke therefore it can be seen in the same colour from a particular distance.

**Colour of Sun at Sunrise and Sunset:** [CBSE 2013] Light from the sun near the horizon passes through thicker layers of air and layer distances in the earth's atmosphere before reaching our eyes.

Near the horizon, most of the blue light and shorter wavelengths are scattered away by the particles. Therefore, the light that reaches our eyes is of longer wavelengths . This gives rise to reddish appearance of sun.

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# QUESTIONS FROM CBSE SQP 2021-22

34.	<p><b>Assertion:</b> Sky appears blue in the day time.  <b>Reason:</b> White light is composed of seven colours.</p> <p>Both A and R is true but R is not correct explanation for A</p>	
<b>Case</b>	In an experiment, Pooja used a equilateral triangular glass prism and projected a narrow beam of white light source from one side of the surface of the prism. She placed a screen on the other side and saw many colours appearing as patches on the screen. But when she used a red light source, she could only see a red patch on the screen. Similarly she used a blue and green light source and could only see one colour patch on both occasions.	
57.	<p>The phenomenon that she was trying to demonstrate was:</p> <p>A. Dispersion  B. Reflection  C. Refraction  D. Scattering.</p>	Ans A
58.	<p>The reason why she could no see any other colour when the red light was used was because:</p> <p>A. Red colour does not refract in prism.  B. Red colour is monochromatic.  C. The prism was defective.  D. The prism is opaque to red colour.</p>	Ans B
59.	<p>Which of the following can be the correct explanation that Pooja can give to her friends to explain this phenomenon?</p> <p>A. Different lights travel faster in the glass prism at different rates.  B. Any light would disperse in the prism.  C. Enough data is not available to make a scientific explanation in this case.  D. Different wavelengths travel at different speeds in the glass.</p>	Ans D
60.	<p>She also could relate to another natural phenomenon that we observe on a rainy humid day as the sun comes out. What could be that phenomenon?</p> <p>A. Lightning.  B. Blueness of the sky.  C. Rainbow.  D. Scattering of light.</p>	Ans C

# PREVIOUS YEAR QUESTIONS

(Converted into MCQ format)

**Q1. Why does the sky look blue on a clear day ?**

- A) Because no other color appear during day
- B) Because blue color of light is scattered most by the particles in the atmosphere
- C) Because blue color is having longest wavelength
- D) None of the above

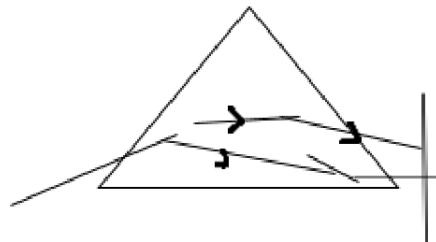
Ans : Option B

**Q2. A student very cautiously traces the path of a ray through a glass slab for different values of the angle of incidence 'r'. He then measures the corresponding values of the angle of refraction 'r' and the angle of emergence 'e' for every value of the angle of incidence. On analysing these measurements of angles, his conclusion would be.**

- A)  $i > r > e$
- B)  $i = e > r$
- C)  $i < r < e$
- D)  $i = e < r$

Ans : Option B

**Q3. ) A triangular glass prism after passing through the prism it produces a spectrum XY on a screen**



i) **State the colour x and y respectively.**

- A) Red and violet
- B) Orange and violet
- C) Violet and red
- D) Green and red

Ans : Option C

ii) **Why do different colors of white light bend through different angles with respect to the incident beam of light ?**

- A) Because of their nature
- B) Because of their intensity

- C) Because of their velocity
- D) All of the above

Ans : Option C

**Q4) What happens when a second identical prism is placed in an inverted position with respect to the first prism ?**

- A) No changes in color
- B) Blue light formed by recombination
- C) White light formed again
- D) None of the above

Ans : Option C

**Q5) Rainbow phenomenon is caused due to**

- A) Dispersion of light
- B) Tidal effect of light
- C) Speed of light
- D) All of the above

Ans : Option A

**Q6) What is "dispersion of white light"?**

- A) Scattering of light as a light beam passes through a colloid
- B) When a light ray is incident on the surface separating two media, the direction of the ray changes
- C) The splitting of white light into seven colours on refraction
- D) None of the above

Ans : Option C

**Q7) Why stars appear to twinkle and planet do not twinkle ?**

- A) Star have to cover more layers of atmosphere as compare to planets
- B) Star is closer to earth due to which it twinkle
- C) Both of the above
- D) None of the above

Ans : Option A

**Q8) Why do different components of light split up into spectrum when it passes through a triangular prism ?**

- A) Different colors travel through glass prism at different wavelengths
- B) Different colors travel through glass prism at different frequency
- C) Different colors travel through glass prism at different speeds
- D) Depends on the nature of prism

Ans : Option C

**Q9) Choose the correct phenomena observed in nature subsequent to the scattering of light is :**

- A) Danger signals or stops signals are usually blue
- B) Sun appears white during sunset or sunrise
- C) Blueness of distant mountains
- D) Sun appears red when overhead

Ans : Option C

**Q10) . A student is unable to see clearly the words written on the black board placed at distance of approximately 3m from him. Name of the defect of vision of the boy is suffering from.**

- A) . Night blindness
- B) Hypermyopia
- C) Myopia
- D) None of the above

Ans : Option C

**Q11) Why do stars twinkle?**

- A) actual position of star is different from the apparent position of the star
- B) temperature and density of layers of atmosphere changes continuously, due to which apparent position of star remains constant
- C) temperature and density of layers of atmosphere changes continuously, due to which apparent position of star changes continuously
- D) none of the above

Ans : Option C

**Q12) Why does sun appear reddish early in the morning?**

- A) scattering of red light is more than blue light
- B) due to less scattering of red light than blue light
- C) equal scattering of both red and blue light
- D) none of the above

Ans : Option B